Lesson 5. SCH method of mixture

5.1.3 Thermal properties of materials

	Learning outcomes	Additional guidance
	Learners should be able to demonstrate and apply their knowledge and understanding of:	
(a)	specific heat capacity of a substance; the equation $E = mc\Delta\theta$	HSW4 Estimating specific heat capacity, using method of mixture.
(b) (i)	an electrical experiment to determine the specific heat capacity of a metal or a liquid	HSW5
(ii)	techniques and procedures used for an electrical method to determine the specific heat capacity of a metal block and a liquid	

(6) M - Select and apply the equation for specific heat capacity
(7) S - Describe uncertainties and solutions to an investigation
(8) C - Describe the 'method of mixture' way of finding the specific heat capacity of water

Specific heat capacity (method of mixture)

STARTER:
1. Write a **method** to measure the specific heat capacity of a **liquid**
Think about **equipment (- Include a labelled diagram), measurements and your calculations, uncertainties/errors with solutions.**
2. Mark using the mark scheme. /8
3. www /ebi feedback referring to mark scheme.

Kilo 10^3
Mega 10^6
Giga 10^9

Explain how you could find the SHC of a metal without electricity in a lab.

An experiment to calculate the specific heat capacity of a liquid

labelled diagram (2 marks):

liquid in vessel with electrical heater (submerged) and thermometer

B1

ammeter connected in series between supply and heater AND voltmeter connected across heater.

B1

Allow *use of joule meter if convincingly connected to heater and power supply i.e. 2 wires from power supply two wires to heater*

list of measurements (3 marks):

mass of liquid,

B1

initial and final temperature/change of temp (of the liquid)

B1

I, V and t values OR energy meter readings OR power and time

B1

Allow *such things as "find mass", "known mass", "10K temp rise", "time for 2 minutes" "known power", etc.*

explanation (1 mark):

E = mcΔθ rearranged to c = E/mΔθ ***Allow*** *ItV/mΔθ.*

B1

uncertainties (2 marks) each stated with explanation of remedy: e.g.

- heat losses (makes E or Δθ uncertain) *(solved by)* insulating beaker/use lid

- false temp reading *(solved by)* stir the liquid

B1

- temp continues to rise after heater switched off measure highest value

B1

- thermal capacity of vessel *(solved by)* take this into account in calculation

2 max

Do not allow *"repeat the experiment".*

Give credit for valid suggestions if mentioned anywhere in the description of the experiment.

[8]

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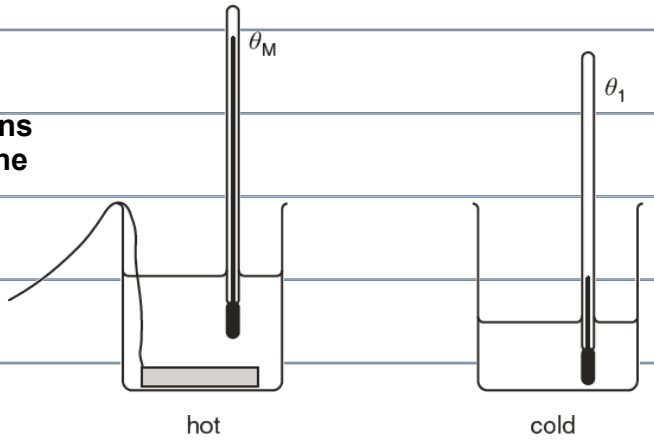
Practical Task: Finding specific heat capacity of a metal, by method of mixtures.

Activity:
Follow the booklet instructions carefully to find the SHC of the metal. Suggest limitations.



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Plenary:

Peer mark hwk -

Use the practical guidance information for more guidance

Write www /ebi. SR in response

Kilo 10^3

Mega 10^6

Giga 10^9

Key point

	Expected Answers	Mark	Additional Guidance
A1.1	Sets up the experiment safely and correctly without help. ✓ Determines the temperature of the water and 100 g mass without help. ✓	2	Any help given should be recorded on the front cover of the task sheet. Any help given should be recorded on the front cover of the task sheet.
A1.2	Calculates a value for E correctly. ✓ Repeats the experiment for one further value of starting temperature. ✓	2	Penalise power of 10 error / inconsistent unit. Any help given should be recorded on the front cover of the task sheet. θ_M must be in the range 60 °C to 70 °C
A1.3	Identifies one hazard **and** describes appropriate safety precaution. ✓	1	e.g. avoid splashing as the mass is inserted **and** so put in beaker slowly, or breaking the beaker **and** so put in beaker slowly/ carefully. Do not allow 'use goggles' / 'use lab coats' / 'tie hair back' / 'string' / '(oven) gloves'.
B1.1	Records **all** data required in a suitable table. ✓ Correctly determines both values for s.h.c. ✓	2	The table must include the following quantities: θ_M, θ_2, $(\theta_M - \theta_2)$, $(\theta_2 - \theta_1)$, E. Ignore units, sig. fig. and d.p. One value should be centre value ±50%
B1.2	Discusses with appropriate justification the value of the s.h.c. of the metal block. Supports the observations by sound reasoning in terms of the energy losses. ✓✓✓	3	Credit the following marking points and ignore reference to one of the s.h.c. values being greater/smaller than the other. The s.h.c. values are different because the 100 g mass: 1. loses more energy when transferred from the higher temperature hot water; 2. also warms up the beaker/container (and the cold water); 3. may not have reached temperature θ_M/thermal equilibrium. 4. Allow one other detailed correct statement that supports the observations. Do not allow loses energy (to surroundings) when transferred from hot water to cold water.
	Total	**10**	